

Coastal Engineering Technical Note

FIELD ESTIMATION OF LONGSHORE SEDIMENT TRANSPORT ALONG THE CALIFORNIA COAST

PURPOSE: To provide information on a technique used in the South Pacific Division for making continuous estimations of longshore transport of sand.

BACKGROUND: The technique has been developed under the California Coastal Data Collection Program (CCDCP). The longshore transport is estimated by making automatic daily measurements of the wave direction and intensity outside the surf zone with pressure gages (sensors). These gages are now installed at the following California locations:

Crescent City	Santa Cruz Harbor	Sunset
Stinson Beach	Santa Barbara Point	Oceanside
Pacifica	Santa Barbara	Mission Bay

DESCRIPTION OF EQUIPMENT: The gage assembly is an array of four pressure sensors at the corners of a square pipe frame that is 20 feet (6 m) on a side. A sketch of the array frame with temporary floatation is shown in Figure 1. The array is normally installed at a depth of about 30 feet (9 m). The frame is connected to a shore terminal by a cable. A computer at the Scripps Institute of Oceanography collects the data and processes it.

METHODS: The longshore transport prediction is based upon the *Shore Protection Manual* formula (Section 4.532), which is put into a form suitable for using measurements outside the surf zone. A description of this prediction method is contained in the paper by Seymour and Higgins (1978). The wave characteristics are measured every six hours and averaged for the day. A daily estimate of the longshore transport is then made. The daily estimates are algebraically added to produce an estimate of the net transport for a given period.

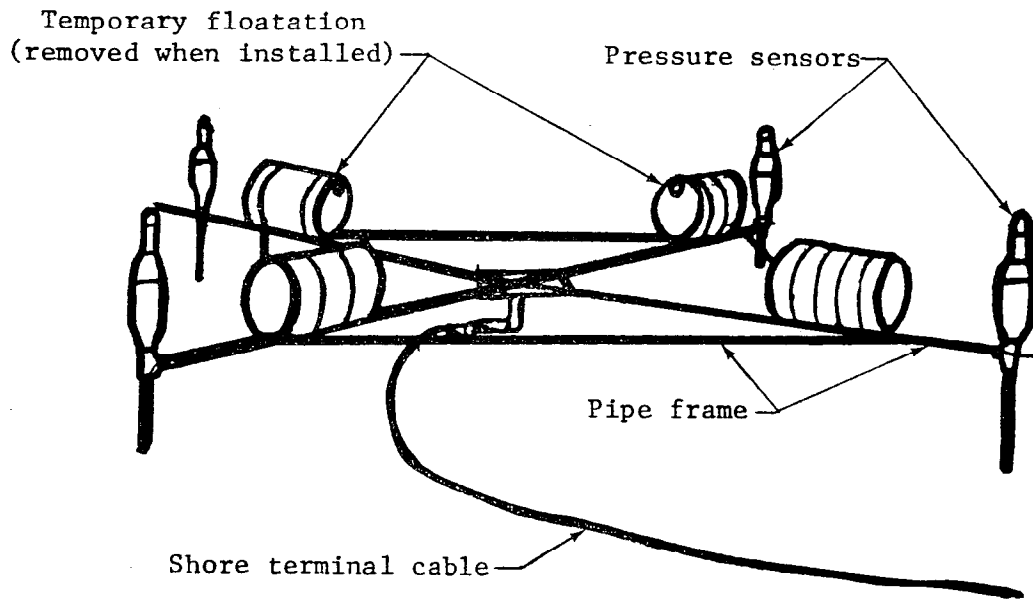


Figure 1. Pressure Sensors Array Frame with Temporary Floatation

DISCUSSION: At Santa Cruz Harbor, the results were compared with the volume dredged from the harbor over a 16 month period. The net transport estimated agreed with the dredging records within 5 percent, assuming that the amount dredged accurately represents the net transport. This study is described in the paper by Seymour, Pirie and Domurat (1979). Figure 2 shows the estimated net transport at Santa Cruz Harbor and Figure 3 shows the predicted net transport compared to the dredging records. The net transport at Santa Cruz for the year ending January 1979 was estimated at 82,000 cubic yards. Figure 4 shows the estimated net transport over a 19-month period at Oceanside. It can be seen that the net transport for 1979 is nearly zero, although the average transport rate at this location has been estimated at about 200,000 cubic yards per year.

Although the reliability or accuracy of this transport estimate method is not yet proven, this method appears to have considerable promise. As with all gage systems, many years of record are required to obtain climate estimates; thus, the use of the gage seems most applicable to monitoring programs or sites where funds are available for long term gaging. Considerations of whether a gage of this type is appropriate for the site depends upon the complexity of the bathymetry and the wave climate.

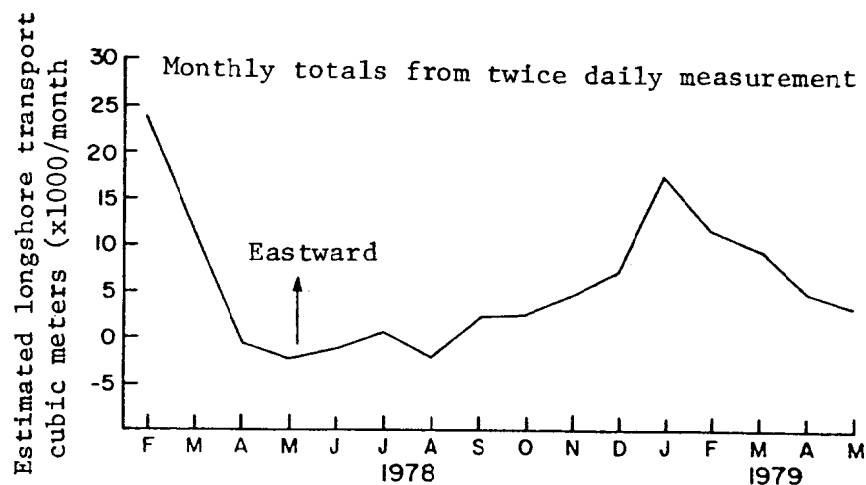


Figure 2. Estimation of Net Longshore Transport at Santa Cruz Harbor, California

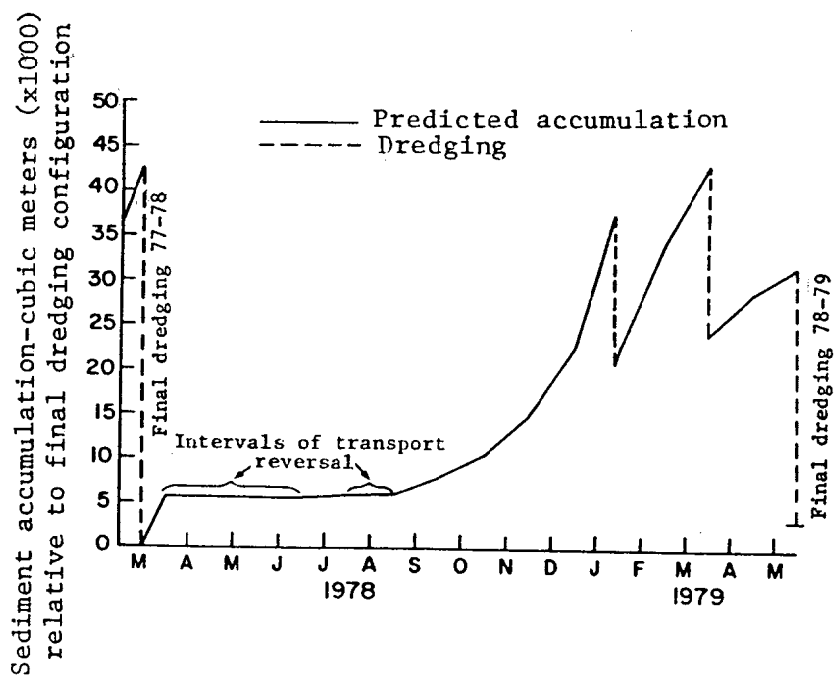


Figure 3. Prediction of Net Harbor Shoaling at Santa Cruz, California

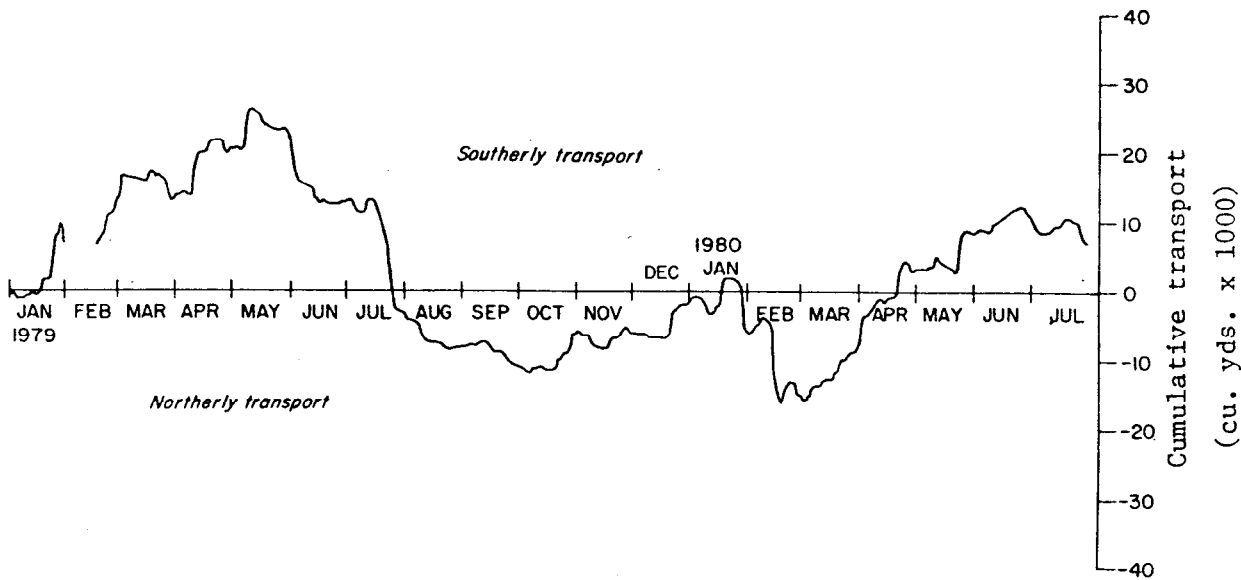


Figure 4. Oceanside Net Longshore Sand Transport
Cumulative Volumes from January 3, 1979
to July 30, 1980

POINTS OF CONTACT: Mr. Orville Magoon, South Pacific Division (415) 556-5352 or FTS 556-5352, for SPD experience with the gages; Dr. C.L. Vincent, CERC (202) 325-7397, for advice on site suitability.

REFERENCES:

- SEYMOUR, R.J. and HIGGINS, A.L., "Continuous Estimation of Longshore Sand Transport." *Symposium on Tech. Environmental, Socioeconomic and Regulatory Aspects of Coastal Zone Management*, San Francisco, California, March 14-16, 1978. ASCE, Coastal Zone '78, Vol. III, 2308-2318 pp.
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- U.S. ARMY, CORPS OF ENGINEERS, COASTAL ENGINEERING RESEARCH CENTER, *Shore Protection Manual*, 3d ed., Vols. I, II, and III, Stock No. 008-002-00113-1, Government Printing Office, Washington, D.C., 1977, 1,262 pp.